

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/JP2004/017670

International filing date (day/month/year)
22.11.2004

Priority date (day/month/year)
25.11.2003

International Patent Classification (IPC) or both national classification and IPC
G01B15/02, G06M9/00

Applicant
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1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**International application No.
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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material:
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing:
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-13
	No: Claims	
Inventive step (IS)	Yes: Claims	1-5, 9-13
	No: Claims	6-8
Industrial applicability (IA)	Yes: Claims	1-13
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

The following documents are referred to in this communication:

- D1 : PATENT ABSTRACTS OF JAPAN vol. 007, no. 012 (M-186), 19 January 1983
& JP 57 170347 A
D2 : PATENT ABSTRACTS OF JAPAN vol. 018, no. 624 (P-1833), 28 November
1994 & JP 06 241763 A
D3 : DE 199 22 125 A1
D4 : US 5 539 322 A
D5: US-A-3 490 037

Re Item V:

1. Technical Field: Measuring the number of layers / thickness of a multilayer object
2. Prior Art

The documents of the International Search Report relate to measuring the number of layers and the thickness, respectively, by using microwaves. In **D1** radiation from a Gunn diode is transmitted through one or more sheets of paper, reflected, again transmitted through the paper and captured by a detector the signal of which is used to determine changes in the number of sheets. In **D2** oscillation means irradiate an envelope. A receiver captures the reflected signal to determine the number of cards in the envelope. In **D3** the number of sheets in a multilayer object is determined. The object is irradiated by a microwave and the reflected signals are detected by a receiver. In **D4** the number of paint layers on a car body is determined. The object is irradiated by a Gunn diode and the number of layers is determined from the reflected radiation. Finally, in **D5** the thickness of a rolled material is measured by detecting the phase of a transmitted microwave.

3. Novelty (Article 33(2) PCT)

The subject matter of independent claims 1 and 12 differs from disclosure of D1-D4 (which can be seen equally as closest prior art for this claim) in that the counting of the number of layers is performed on the basis of signals of the electromagnetic waves reflected at the interfaces of the layers and obtained by the reception means.

The subject matter of independent claims 1 and 12 is thus new.

4. Inventive Step (Article 33 (3) PCT)

- 4.1 The contribution of claims 1 and 12 over D1-D4 provide a direct approach of determining the number of layers (the signals of the reflections at the interfaces can be directly identified and counted). In the available prior art there was no indication found to select this way of counting the number of layers. In particular, D1-D4 propose different approaches (D1: amplitude and phase; D2 and D4: evaluation of amplitude; D3: FTT, spectral or temporal behaviour in general). **The subject matter of claims 1 and 12 is thus also based on inventive step.**
- 4.2 The subject matter of **independent claim 6** is not based on an inventive step: In **D1** one or more sheets of paper 6 ("double gathering") are irradiated by a Gunn diode 1. The radiation transmitted through the sheets is reflected at the terminal of waveguide 4, it travels back to the sheets, and it is transmitted again through the sheets and finally captured by receiver 2. Both transmissions through the sheets lead to respective phase changes of the microwave which is then used to determine "changes in the number of gathered leaves", ie. in fact for counting the number of sheets. It is irrelevant that this determination is also based on the amplitude; claim 6 does not define that the phase is the only basis for determining the number of sheets. The subject matter of claim 6 differs therefrom only in that the phase shift is detected relative to the phase of the incident wave. This is however the usual and well-known way to measure a phase shift; only as an example it is referred to **D5** (Fig. 1; col. 2, l. 41-col. 3, l. 10) which applies this relation in an analogous situation. Accordingly, an inventive step is not seen.
- 4.3 The particular features of **claims 7 and 8** do not contribute to an inventive activity, either: Using an electromagnetic pulse and measuring the delay time in transmission is an absolutely usual alternative which is not linked with an inventive step. Finally, coupling a wave (by a beam-splitter etc.) into a reference detector is a standard technique for obtaining a phase reference (see eg. in **D5**).

5. Dependent Claims:

The dependent claims 2-5 and 9-13 only add particular features to the subject matter of independent claims 1 and 12, respectively. **The subject matter of claims 2-5 and 9-13 is thus also new and based on an inventive step.**

6. Industrial Applicability (Article 33(4) PCT):

The subject matter of claims 1-13 is industrially applicable, eg. in the production of paper stacks or in copy machines.

Re Item VII:

The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT). Moreover, the documents D1, D3 and D4 are not cited in the description, contrary to the requirements of Rule 5.1(a)(ii) PCT.

Re Item VIII (Article 6 PCT):

1. The present application contains **two independent apparatus claims 1 and 6**. The claims therefore lack conciseness, contrary to Article 6 PCT. It is added that the present claims are directed to different and independent concepts (claims 6-8: measuring the phase in transmission; claims 1-5, 9-13; measuring the reflection at the interfaces) which is contrary to Rule 13 EPC, unity of invention.
2. **Claim 3** is not supported by the description as required by Article 6 PCT. There is no embodiment demonstrating how the number of layers can be determined on the basis of the phase shift measured in reflection geometry.
3. It is essential for the invention according to claims 1 and 12 that the number of layers is counted on the basis of signals of the electromagnetic waves reflected at said interfaces of the layers. There should be not a single doubt in said claims that exactly these reflections are meant. For the above opinion it has been assumed that a respective clarifying wording is included in claims 1 and 12.

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AUTHORITY (SEPARATE SHEET)**

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4. Page 14, lines 1-16 describes a method as "another aspect of the invention" whereas a respective independent claim is missing. The description is thus not in line with the claims, contrary to Article 6 and Rule 5.1(a)(iii) PCT.